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Segment No. 21-45-01

WA 45-1020

CASHMERE SEWAGE TREATMENT PLANT/ TREE TOP, INC. CASHMERE PLANT CLASS II INSPECTION OF JANUARY 13-14, 1987

by

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ABSTRACT

A Class II inspection was conducted at the Cashmere Sewage Treatment Plant (STP) on January 13 and 14, 1987. The STP is an aerated lagoon system serving the city of Cashmere and the Tree Top, Inc. Cashmere Plant (Tree Top). During the inspection, discharges were within most city of Cashmere Order limits, expired Tree Top NPDES permit limits, and proposed NPDES permit limits for both facilities. Low total suspended solids (TSS) removal efficiency and high effluent chlorine residual concentrations were potential problems. The effluent was not toxic to the bioassay organisms tested.

INTRODUCTION

A Class II inspection was conducted at the Cashmere Sewage Treatment Plant on January 13 and 14, 1987. Samples were also collected at Tree Top, the largest contributor to the STP. The inspection was conducted by Don Reif and Marc Heffner, Ecology Water Quality Investigations Section. Providing assistance were the Cashmere STP operators Charlie Cruickshank, Bob Schmidt, and Leroy Morrow. Dan Hart, Fred Munson, and Bill Cordell assisted at Tree Top.

Objectives of the survey included:

1. Collect samples and make flow measurements to estimate plant loading and treatment efficiency. Compare data with National Pollutant Discharge Elimination System (NPDES) permit limits.

2. Evaluate effluent toxicity using bioassay tests.

3. Consider possible receiving water impacts by evaluating effluent data and receiving water dilution ratios.

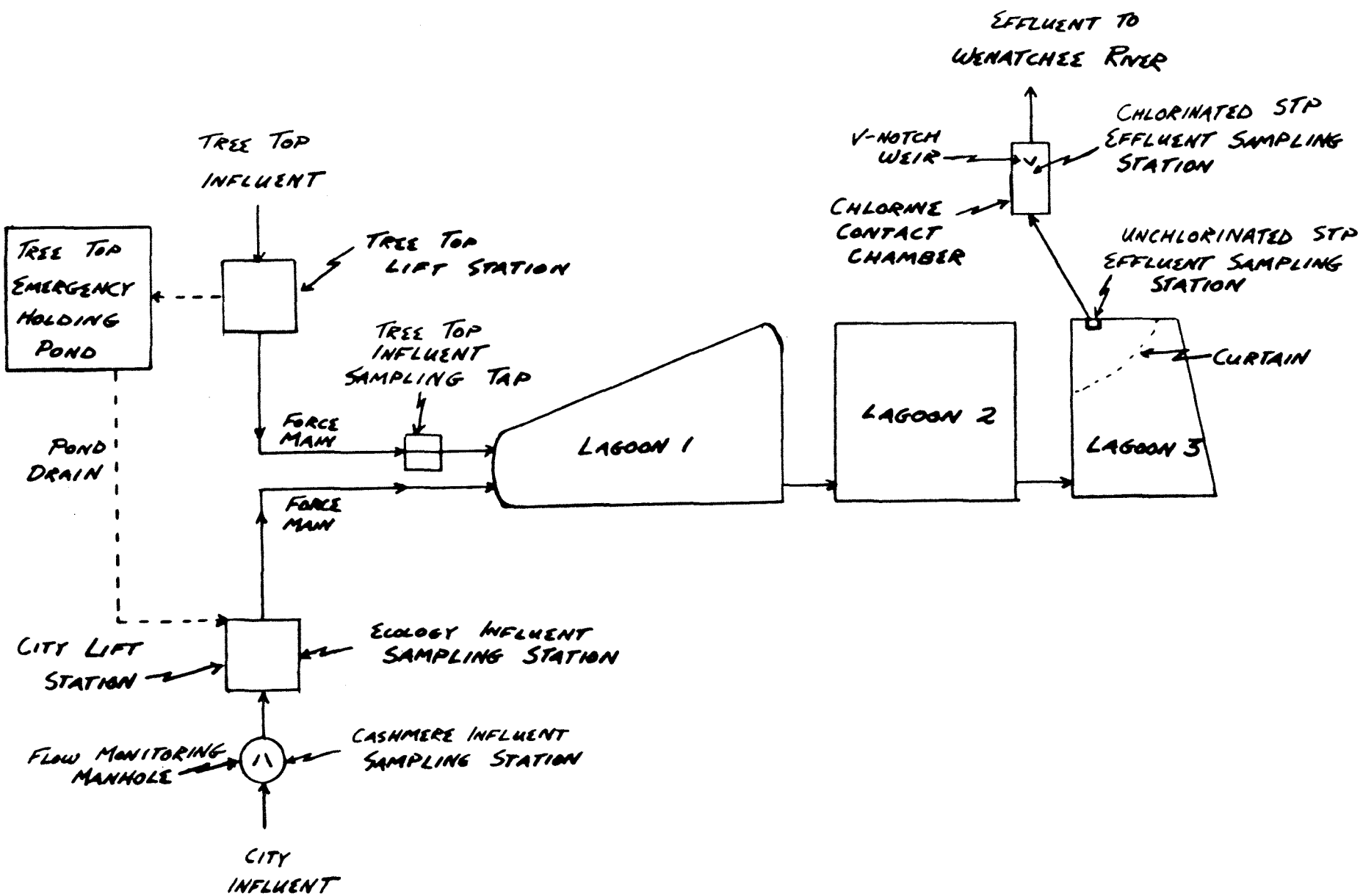
4. Review laboratory procedures (including sample splits with the operator) to assess accuracy of results and conformance with approved analytical techniques.

The Cashmere STP discharge is limited by Ecology Order DE 85-559, while Tree Top is limited by expired NPDES permit #WA-000221-6.

SETTING

The Cashmere STP is an aerated lagoon facility discharging into the Wenatchee River (Figure 1). All three cells are aerated, with a fabric baffle isolating the discharge corner of the third cell to encourage additional settling. The treated wastewater is chlorinated, then detained in a contact basin prior to discharge. An outfall with diffuser extends into the river.

The STP treats wastes from the City of Cashmere and from Tree Top. The Tree Top wastes are generated primarily from processing apples and pears into juice concentrate. Tree Top wastes are pumped to the STP



January 1987.

in a force main. A second force main carries wastewater generated in the city.

Waste flow at Tree Top can be divided into three categories:

1. Process wastes which are sent directly to the Cashmere STP.

2. Reclaim water, which is water driven from the fruit during the concentrating process. Reclaim water had been sent to the river until an unacceptable BOD_5 concentration was discovered. The reclaim was redirected to the STP and will continue to be sent there until the BOD_5 problem is resolved.

3. Excess cooling water and yard/roof runoff which are routed to the river.

The Tree Top lift station failed at night during the inspection sampling period. Tree Top flow was automatically routed into a lined holding basin. Valves were manually opened the next morning and the contents of the basin were routed to the city lift station. The STP operators reported that Tree Top lift station failure is infrequent, occurring once every two to three years.

While the pump station was out of service, the Tree Top discharge scheme was modified slightly to decrease flow to the lift station. The reclaim water was routed directly to the river until repairs were made.

PROCEDURE

City influent, Tree Top influent, and STP effluent composite samples were collected by Ecology. Isco automatic composite samplers were set to collect approximately 200 mL. of sample every 30 minutes for 24 hours. The city routinely monitors these three stations as follows: city influent grab sample, STP effluent grab sample, and Tree Top influent automatic flow-paced composite sample. Both the Ecology and Cashmere samples of the Tree Top influent were affected by the lift station malfunction. An incomplete sample was collected by the city while much of the Ecology sample was collected from the pooled waste in the force main. The Ecology city influent sample may have been slightly affected by the Tree Top waste. The last one or two aliquots collected included the Tree Top waste that was routed to the city lift station and mixed with the city waste. Samples were split for analysis by the Ecology, Cashmere, and Treetop laboratories. Sampling times and parameters analyzed are summarized in Table 1.

Grab samples were collected at both the STP and Tree Top. Sampling stations, times, and parameters analyzed are included in Table 1. Also, grab composite samples of the STP effluent were collected for bioassay testing as noted in Table 1.

Plant flow meters measure city influent, Tree Top influent, and STP effluent flow rates. Ecology instantaneous measurements were made to

Table 1. Samples collected - Cashmere/Tree Top, January 1987.

Station	Date	Time	Sampler***	Laboratory***	Field Analyses: Temperature (°C)	pH (S.U.)	Cond. (umhos/cm)	Chl. Resid. (mg/L) Free	Chl. Resid. (mg/L) Total	Diss. Oxygen (mg/L)	Lab: F.C. (#/100 mL)	Enterococci (#/100 mL)	Oil & Grease (mg/L)	BOD_5 (mg/L)	COD (mg/L)	Solids (mg/L): TS	TNVS	TSS	TNVSS	Settleable Solids (mL/L)	Turbidity (NTU)	Nutrients (mg/L): NH_3-N	NO_2-N	NO_3-N	NO_2+NO_3-N	Total-P	pH (S.U.)	Cond. (umhos/cm)	Alk. (mg/L as $CaCO_3$)	Bioassay**
City Influent	1/13	0940			X	X	X								X			X				X			X	X		X		
		1610			X	X	X								X			X				X			X	X		X		
	1/13-14	0930-	Ecology	Ecology										X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	
	(Comp.)	0900		Cashmere										X	X			X												
	1/14	1030	Cashmere	Ecology										X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	
				Cashmere										X	X			X												
Effluent	1/13	1025			X	X	X	X	X	X					X			X				X			X	X		X		
		1530			X	X	X	X	X						X			X				X			X	X		X		
	1/14	0915		Ecology	X	X	X	X	X		X	X			X			X				X			X	X		X		
				Cashmere					X																					
		1105		Ecology							X	X																		
				Cashmere							X																			
	1/13-14+	0930-	Ecology	Ecology										X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	
	(Comp.)	0930		Cashmere										X	X			X												
	1/14+	0915	Cashmere	Ecology										X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	
				Cashmere										X	X			X												
	1/13-14 (Comp.)	*	Ecology	Ecology																										X
River	1/13	1300			X	X	X								X			X		X		X			X	X		X	X	
	1/14	1130			X	X	X				X	X			X			X		X		X			X	X		X	X	
Tree Top Influent	1/13	1115			X	X	X								X			X				X			X	X		X		
		1600			X	X	X								X			X				X			X	X		X		
	1/13-14	0930-	Ecology	Ecology										X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	
	(Comp)++	0900		Cashmere										X	X			X												
				Tree Top										X	X															
	1/13-14	0930-	Cashmere	Ecology										X	X	X	X	X	X		X	X			X	X	X	X	X	
	(Comp)++	0930		Cashmere										X	X			X												
				Tree Top										X	X															
Runoff	1/13	1325	Ecology	Ecology	X	X	X						X		X			X			X	X			X	X		X	X	
				Tree Top										X	X															
Runoff + Reclaim	1/14	0805	Ecology	Ecology									X																	
Reclaim	1/13	1340			X	X	X																							
	1/14	0805			X	X	X																							
	1/13-14 (Comp)	+++	Ecology	Ecology										X	X	X	X	X	X		X	X	X	X		X	X	X	X	
				Tree Top										X	X															

*1/2 collected on 1/13 at 1530; 1/2 collected on 1/14 at 0915
**organisms tested were Salmo gairdneri (rainbow trout); Ceriodaphnia dubia, and Selenastrum capricornutum
***grab samples collected and analyzed by Ecology unless otherwise noted
+unchlorinated sample; all other effluent samples were chlorinated
++incomplete sample due to pump station malfunction
+++Half collected on 1/13 at 1340; half collected on 1/14 at 0805

check the accuracy of the city influent and STP effluent flow meters. The Tree Top influent flow meter was an in-line unit, and Ecology verification of its accuracy could not be made.

RESULTS AND DISCUSSION

Flow measurements made at the plant are presented in Table 2. Due to the Tree Top pump station failure, a "typical" Tree Top flow was not measured. Flows from the two days prior to the inspection, as reported on the Cashmere daily monitoring report (DMR), were averaged and used to calculate expected loadings.

The city influent is measured in a manhole just upstream of the city lift station. A modified Parshall flume serves as the primary measuring device. The device includes the approach structure only, with the throat and exit structure missing. The plant meter agreed closely with the Ecology instantaneous measurement based on the 6-inch Parshall flume rating (Table 2). A bucket-and-stopwatch measurement is suggested to assure that use of the 6-inch Parshall flume rating curve is appropriate for the modified structure.

The STP effluent is measured at a 90-degree, V-notch weir in the chlorine contact chamber. The Ecology instantaneous measurements indicated that the plant meter was calibrated approximately 0.1 MGD too low (Table 2). The Cashmere crew recalibrated the meter after the inspection. Brief review of the February DMR found a reported average influent of 0.48 MGD (city + Tree Top) and an average effluent of 0.58 MGD. A recheck of all meters by city personnel is suggested.

Sample results are presented in Table 3. Table 4 compares the data to NPDES permit limits. The inspection data were generally within the monthly and weekly permit limits. The 35 percent TSS removal during the inspection was well below the proposed monthly average minimum limit of 85 percent TSS removal. Fecal coliform concentrations equaled past and proposed permit limits. Also, the STP effluent flow rate was approaching the proposed limit.

Plant performance during the inspection was likely better than typical during winter. The operators reported unusually warm weather with minimal snowfall. Thin ice covered only a small portion of the lagoons in contrast to the typical heavier freeze-up. The warm weather should encourage faster biological degradation in the lagoons. The open surface should encourage higher dissolved oxygen (D.O.) concentrations in the lagoons (an effluent D.O. concentration of 8.7 mg/L was measured; Table 3). Both conditions could contribute to improved treatment.

The operator also reported that nitrogen was being added to the third lagoon cell in an effort to reduce the amount of chlorine needed for disinfection. Winter chlorine dosage is the primary concern. From January 1985 to March 1985, chlorine usage was quite high; 53 to 75 lbs/D monthly averages. Monthly averages are typically <10 to 20 lbs/D. January - March 1985 monthly average effluent fecal coliform concentrations were also high (45 to 282/100 mL). NPDES permit monthly

Table 2. Flow measurements - Cashmere/Tree Top, January 1987.

Month	Day	Time	Instantaneous Flow (MGD)	Totalizer reading	Flow for Time Increment (MGD)
City Influent Flow Measurements					
1	13	0930	0.20*	6850119	
					0.20
1	13	1610	0.15	6850683	
					0.14
1	14	0835	0.30	6851652	
Average flow during inspection = 0.16					
Effluent Flow Measurements					
1	13	0845	0.35	7081535	
					0.37
1	13	1035	0.35**	7081818	
					0.36
1	13	1530	0.35	7082558	
					0.36
1	14	0925	0.35**	7085281	
Average flow during inspection - 0.36***					

*Ecology instantaneous measurement was 0.19 MGD assuming a standard 6-inch Parshall flume and 0.17 MGD using broad crested rectangular weir equation.

**Ecology instantaneous measurement: 0.45 MGD.

***0.45 MGD used for load calculations due to suspected meter error.

Table 3. Ecology analytical results - Cashmere/Tree Top, January 1987.

Station	Date	Time	Sampler***	Field Analyses: Temperature (°C)	pH (S.U.)	Cond. (umhos/cm)	Chl. Resid. (mg/L) Free	Chl. Resid. (mg/L) Total	D.O. (mg/L)	F.C. (#/100 mL)	Laboratory Analyses: Enterococci (#/100 mL)	Oil & Grease (mg/L)	BOD_5 (mg/L)	COD (mg/L)	Solids (mg/L) TS	Solids (mg/L) TNVS	Solids (mg/L) TSS	Solids (mg/L) TNVSS	Settleable Solids (ml/L)	Turbidity (NTU)	Nutrients (mg/L) NH_3-N	Nutrients (mg/L) NO_2-N	Nutrients (mg/L) NO_3-N	Nutrients (mg/L) NO_2+NO_3	Nutrients (mg/L) Total-P	pH (S.U.)	Cond. (umhos/cm)	Alkalinity (mg/L as $CaCO_3$)
City																					18							
Influent	1/13	0940		12.9	7.8	950								600			110				19			1.2	1.6		950	
		1610		12.1	6.9	880								460			130				17			0.74	1.7		881	
	1/13-14	Comp.	Ecology										350	850	950	510	290	110	20	45	18	0.01	0.79		1.7	7.5	1060	344
	1/14	1030	Cashmere										160	490	660	370	180	65	13	28	18	<0.01	0.75		1.6	7.8	862	334
Effluent	1/13	1025		0.6	6.7	1070	3.0	5.0	8.7**					550			160				1.5			0.17	1.5		1021	
		1530		1.3	6.4	1220	3.0	5.0						430			190				1.4			0.14	1.5		1020	
	1/14	0915		0.4	7.1	1180	2.5	2.5		400	470			580			160				1.2			0.12	1.5		1014	
		1105								200*	900																	
	1/13-14	Comp.	Ecology +										150	590	1100	510	350	64	<0.1	25	1.4	0.01	0.05		1.5	7.5	1020	387
	1/14	0915	Cashmere +										150	570	1100	530	330	77	<0.1	26	1.5	0.02	0.14		1.6	7.4	1020	390
Tree Top																												
Influent	1/13	1115		24.2	5.3	430								6500			740				0.12			1.3	4.9		437	
		1600		19.2	4.8	450								5500			460				0.30			0.09	4.1		489	
	1/13-14	Comp.++	Ecology										3700	5100	3400	330	670	130	5.5	180	0.12	0.14	0.06		4.1	5.0	525	56
	1/13-14	Comp.++	Cashmere										3000	4900	2800	420	980	250		200	0.04			0.06	5.4	5.2	542	83
Runoff	1/13	1325		14.5	6.9	555						1		180			10			6	0.09			0.55	0.2		398	140
Runoff + Reclaim	1/14	0805										16																
Reclaim	1/13	1340		41.6	7.4	50																						
	1/14	0805		46.2	9.5	80																						
	1/13-14	Comp.	Ecology										>340	490	71	37	3	3		<1	0.05	<0.01	0.01		<0.01	10.1	68	27
River	1/13	1300		1.2	6.0	100								<4			<1			<1	0.03			0.18	<0.01		79	42
	1/14	1130		1.2	7.7	100				<1	4			<4			<1			<1	0.02			0.18	<0.01		78	42

*estimated
**unchlorinated sample D.O. = 9.0 mg/L
***grab samples collected by Ecology unless otherwise noted
+unchlorinated sample; all other effluent samples were chlorinated
++incomplete sample due to pump station malfunction

Table 4. Comparison of inspection data to NPDES permit limits - Cashmere/Tree Top, January 1987.

Parameter	Order Limits* Monthly Average	Order Limits* Weekly Average	Proposed NPDES Permit Limits** Monthly Average	Proposed NPDES Permit Limits** Weekly Average	Inspection Data++ Ecology Samples
Municipal Effluent					
Flow (MGD)	0.4		0.21		0.16
BOD_5 (mg/L)	30	45	30	45	
BOD_5 (lbs/D)	80	120	27	41	
TSS (mg/L)	75	113	75	113	
TSS (lbs/D)	200	302	138	143	
Fecal Coli. (#/100 mL)	200	400	200	400	
pH (S.U.)	$6.0 \leq pH \leq 9.0$		$6.0 \leq pH \leq 9.0$		
Industrial Effluent					
Flow (MGD)	0.28		0.28		0.30***
BOD_5 (mg/L)	480	762+	480	762+	
BOD_5 (lbs/D)	1120	1779+	1120	1779+	
TSS (mg/L)	987	1373+	987	1373++	
TSS (lbs/D)	2305	3206+	2305	3206+	
Combined Municipal/Industrial (city) Effluent					
Flow (MGD)	0.68		0.49		0.45
BOD_5 (mg/L)	240	380	281	422	150
BOD_5 (lbs/D)	1200	1899	1147	1721	563
BOD_5 (% removal)			85		94
TSS (mg/L)	501	701	598	897	350
TSS (lbs/D)	2505	3508	2443	3665	1314
TSS (% removal)			85		35
Fecal Coli. (#/100 mL)	200	400	200	400	200 est; 400
pH (S.U.)	$6.0 \leq pH \leq 9.0$		$6.0 \leq pH \leq 9.0$		6.7; 6.4; 7.1
Tree Top					
Non-contact Cooling Water Effluent					
Flow (MGD)	0.086	0.172+			
pH (S.U.)	$6.5 \leq pH \leq 8.5$				6.9
Temperature (°C)	38	60+			14.5
Process Water Effluent					
Flow (MGD)	0.18	0.28			0.30***
BOD_5 (lbs/D)	8400	12600			9260

*Docket limits from Order #DE 85-559 and expired Tree Top permit #WA-000221-6

**Proposed NPDES permit limits from draft of permit #WA-002318-3 which was never issued

+Daily maximum

++Ecology laboratory analyses - municipal effluent and industrial effluent flows are lagoon influent flow measurements

***Due to pump station malfunction during the inspection, DMR flows from the two preceding working days were averaged to estimate the flow

est = estimated

average limits are 200/100 mL. Nitrogen is added to encourage more effective chlorination when the total soluble Kjeldahl-N concentration is <1 mg/L. The theory of this system is unclear, and discontinuing this practice is suggested unless immediate benefits are realized.

The chlorine contact basin was measured during the inspection. Size and volume calculations are presented in Figure 2. The theoretical detention time of 54 minutes at the inspection flow rate closely approximates the one-hour minimum required at average flow (Ecology, 1985). Actual detention time was not measured, but the lack of baffles suggests the actual time is much less than theoretical. Cold temperatures, high effluent solids concentrations, and short-circuiting in the basin may contribute to the high chlorine requirements and poor fecal coliform kills noted during 1985.

Results of the bioassay tests are presented in Table 5. The data indicate minimal effluent toxicity. No mortalities were reported in the rainbow trout (Salmo gairdneri) or ceriodaphnia (Ceriodaphnia dubia) tests. A decrease in productivity with the ceriodaphnia 100 percent effluent test indicates a possible sublethal effect, but this is not of concern given the dilution provided in the receiving water. The algal (Selenastrum capricornutum) test indicated that the effluent stimulated higher productivity in the test cultures. It is assumed that the chlorine in the samples dissipated prior to testing since no mortalities were observed. All results suggest no need for corrective action or additional bioassay testing at this time.

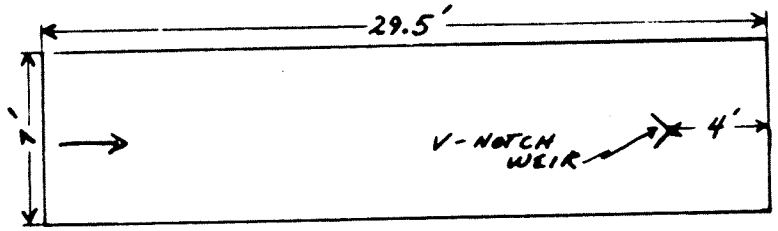
Receiving water impacts due to effluent discharge are estimated in Table 6. The high dilution ratio provided by the river, even at the historic low flow, minimizes receiving water impacts. The only parameter of potential concern was chlorine residual. During the inspection the total chlorine residual ranged from 2.5 to 5.0 mg/L and fecal coliform concentrations approximated the permit limit (Tables 3 and 4). The chlorine residual concentration approaches toxicity criteria in the receiving water at STP flows slightly greater than the monthly average permit limits; a flow that could occur for several days and still not result in a permit violation. Improving chlorination efficiency, possibly with extended detention times to allow lower chlorine residuals, or making allowances for dechlorination during times of high chlorine residuals is recommended.

Laboratory review

Laboratory procedures at the Cashmere STP were good. Cleanliness and attention to detail were emphasized. Suggestions to keep procedures in conformance with approved techniques included:

BOD_5

1. The seed correction for seeded samples should be calculated based on seed control sample results, not with the seeded dilution water blank (APHA, 1985, #5d, p529).



DEPTH 12.5'
SLUDGE 1.5' NEAR WEIR
TOTAL VOLUME = 19,300 gal
VOLUME TO WEIR = 16,700 gal

FIGURE 2 - CASHMERE STP CHLORINE CONTACT CHAMBER - CASHMERE/TREE TOP, JANUARY 1987.

Table 5. STP Effluent Bioassay Results** - Cashmere/Tree Top, January 1987.

96-hour Rainbow trout (Salmo gairdneri) bioassay

Sample	No. of Live Test Organisms Start	No. of Live Test Organisms After 96 hours	Percent Mortality
Control	30	30	0
65% effluent	30	30	0

96-hour algal (Selanastrum capricornutum) bioassay

Sample	No. (cels/mL x 10^6) after 96 hours)*	Percent Stimulation
Control	4.27	0
100% effluent	8.04	88

*Average of three replcates

7-day ceriodaphnia (Ceriodaphnia dubia) bioassay

Sample	Percent Mortality	Mean No. of Young per female
Control	0	14.9
1% effluent	0	21.5
3% effluent	0	26.0
10% effluent	0	23.5
30% effluent	0	11.9
100% effluent	0	4.0+

+significantly lower than control, suggesting some sublethal effect due to 100% effluent

**Salmo gairdneri test performed by Ecology laboratory
Selanastrum capricornutum test performed by E.V.S. Consultants
Ceriodaphnia dubia test performed by the EPA Duluth laboratory

Table 6. Calculated receiving water impacts - Cashmere/Tree Top, January 1987.

Parameter	Flow (MGD)	Dilution Ratio	BOD_5 (mg/L)	TSS (mg/L)	Total Inorganic Nitrogen (mg/L)	Total-P (mg/L)	Turbidity (NTU)	Fecal Coliform (#/100 mL)	Chlorine Residual (mg/L)
Effluent Flow									
Inspection measurements	0.45	--	150	350	1.5	1.5	25	400	5.0
Order limits+	0.68	--	380	701			50**	400	
Proposed NPDES permit limits+	0.49	--	422	897			64**	400	
River									
Inspection measurements	523*	--	<4++	<1	0.21	<0.01	<1	<1	
Impacts on River at Inspection River Flow Rate (523 MGD)* and Effluent Flow Conditions Equal to:									
Inspection measurements		1160:1	0.13	0.30	0.001	0.001	0.02	0.34	0.004
Order limits+		770:1	0.49	0.91			0.06	0.52	0.006*+
Proposed NPDES permit limits+		1070:1	0.39	0.84			0.06	0.37	0.005*+
Impacts on River at January Record Low Flow (351 MGD)* and Effluent Flow Conditions Equal to:									
Inspection measurements		780:1	0.19	0.45	0.002	0.002	0.03	0.51	0.006
Order limits+		520:1	0.73	1.3			0.10	0.77	0.010*+
Proposed NPDES permit limits+		720:1	0.59	1.2			0.09	0.56	0.007*+
Impacts on River at Historical Record Low Flow (232 MGD)* and Effluent Flow Conditions Equal to:									
Inspection measurements		520:1	0.29	0.67	0.003	0.003	0.05	0.77	0.010
Order limits+		340:1	1.1	2.1	0.004*+	0.004*+	0.15	1.2	0.015*+
Proposed NPDES permit limits+		470:1	0.90	1.9	0.003*+	0.003*+	0.14	0.85	0.011*+
Receiving Water Considerations			D.O. >8.0 mg/L (WAC, 1982)		Problem threshold; TIN > 0.092 mg/L & Total-P >0.013 mg/L (EPA, 1985, P.390)		<5 NTU over background (WAC, 1982)	Geometric mean <100/100 mL, <10% of samples with >200/100 mL (WAC, 1982)	Toxicity criteria 0.019 mg/L (EPA, 1986). State criteria for new facilities ≤0.002 mg/L outside mixing zone (Ecology, 1985, p. 164)

++COD measurement

*+calculated with inspection measurement of 5.0 mg/L chlorine residual

*flows from USGS (Spokane office) for Wenatchee River at Monitor. 1 cfs = .65 MGD used for conversions

**linear relationship between TSS and turbidity assumed - parameter not listed by NPDES permit

+weekly limits for BOD_5, TSS, and fecal coliform: monthly average for flow. Docket limit from Order #DE 85-559. Proposed permit limits from draft of permit #WA-002318-3 which was never issued.

2. Dilutions should be set up so the 5-day D.O. depletion is greater than 2.0 mg/L and the D.O. remaining after 5 days is greater than 1.0 mg/L. Dilutions not meeting this criterion should not be averaged with dilutions with valid depletions when calculating the BOD_5.

TSS

1. When tests are set up to determine both total and volatile suspended solids, the filters should be ignited at 550°C for cleaning prior to the test (APHA, 1985, #3a, p.96).

A comparison of the sample splits is presented in Table 7. Results compare acceptably; thus, concerns about analytical accuracy are not raised. The difference between the Cashmere and Ecology city influent sample results suggests that a grab sample is probably inadequate to characterize the waste stream. Collection of a city influent composite sample is suggested. Comparison of the Cashmere and Ecology effluent sample results suggests that lagoon detention time is adequate to allow collection of a grab sample as a representative effluent sample.

RECOMMENDATIONS AND CONCLUSIONS

The Cashmere facility was performing adequately in relation to most permit limits during the inspection. Poor TSS removal and high chlorine residual in the final effluent were problem areas. Recommendations include:

1. The city influent flume was of unusual configuration and the effluent meter was not accurately calibrated. Since the inspection, the effluent meter has been recalibrated. The city should recheck the calibration of all the flow meters.

2. A high chlorine residual concentration was required to provide effluent disinfection during the inspection. High effluent solids concentrations and cold temperatures may contribute to this problem. Addition of nitrogen to improve disinfection was unusual and should be discontinued if immediate benefits are not realized.

   The high effluent chlorine concentration also appeared to be a potential problem in the receiving water at slightly higher effluent flows. Reducing effluent chlorine residual concentration either by improving contact basin efficiency or by providing dechlorination during periods of high residual should be considered.

3. Bioassay test results indicated that the effluent was not toxic. Some stimulation of the Selenastrum algal assay occurred. No further bioassay testing is recommended at the present time.

4. Laboratory techniques looked good. Minor recommendations are included in the discussion. Comparison of the Ecology influent

Table 7. Comparison of laboratory results - Cashmere/Tree Top, January 1987.

Station	Date	Time	Sampler	Laboratory	BOD_5 (mg/L)	TSS (mg/L)	COD (mg/L)	Total Chlorine Residual (mg/L)	Fecal Coliform (#/100mL)
City Influent	1/13-14	Comp.	Ecology	Ecology	350	290	850		
				Cashmere	340	225	663		
	1/14	1030	Cashmere	Ecology	160	180	490		
				Cashmere	140	143	375		
Tree Top Influent*	1/13-14	Comp.	Ecology	Ecology	3700	670	5100		
				Cashmere	2625	545	5490		
				Tree Top	2655		5910		
	1/13-14	Comp.	Cashmere	Ecology	3000	980	4900		
				Cashmere	2450	880	5292		
				Tree Top	2375		4215		
City Effluent**	1/13-14	Comp.	Ecology	Ecology	150	350	590		
				Cashmere	166	338	600		
	1/14	0915	Cashmere	Ecology	150	330	570		
				Cashmere	171	316	600		
	1/14	0915	Ecology	Ecology				2.5	
				Cashmere				2.5	
	1/14	1105	Ecology	Ecology					200+
				Cashmere					78
Tree Top Reclaim	1/13-14	Comp.	Ecology	Ecology	>340		490		
				Tree Top	388		520		
Tree Top Runoff	1/13	1325	Ecology	Ecology			180		
				Tree Top	191		278		

*pump failure affected samples
**unchlorinated except for fecal coliform and chlorine residual samples
+estimated

composite and the Cashmere influent grab suggest that the Cashmere sample does not adequately represent the city influent flow. A composite sample is recommended.

REFERENCES

APHA-AWWA-WPCF, 1985. Standard Methods for the Examination of Water and Wastewater, 16th ed.

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